



**Directorate of
Intelligence**

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International Economic & Energy Weekly

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**International
Economic & Energy
Weekly**

25X1

29 April 1983

iii	Synopsis	25X1
1	Perspective—Energy Security: Still a Major Issue	25X1
3	Briefs Energy International Trade, Technology, and Finance National Developments	
13	Algerian Gas Export Shortfalls: An Energy Security Issue	25X1 25X1
21	Oil Transport From the Persian Gulf: An Energy Security Issue	25X1 25X1
31	Japanese Energy Security: Prospects and Implications	25X1
39	The UK Market for Norwegian Gas: An Energy Security Issue	25X1 25X1
		25X1
	Indicators	

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29 April 1983

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**International
Economic & Energy
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Synopsis

Perspective—Energy Security: Still a Major Issue

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Most recent industry forecasts indicate that energy supplies should be ample to prevent a return of sharp price increases and the resultant slowdown in economic growth for the balance of the decade. These same forecasts indicate that surplus capacity will be gradually eroded over the balance of the 1980s, leaving the market increasingly vulnerable to an oil supply disruption. At the same time, dependence among OECD countries on oil imports from the Middle East will remain sizable and Western Europe is expected to increase its imports of natural gas.

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Algerian Gas Export Shortfalls: An Energy Security Issue

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Serious production problems in its major gasfields will prevent Algeria from being able to meet about one-half of its annual gas export commitments to Western Europe and the United States during the remainder of the decade. This shortfall will reinforce West European views of Algeria as an unreliable supplier.

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Oil Transport From the Persian Gulf: An Energy Security Issue

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Continuing dependence on Persian Gulf oil and the uncertain political climate in the Middle East underscore the potential for a major disruption of non-Communist oil supplies. While Gulf States have considered building additional crude oil pipelines to bypass the vulnerable Strait of Hormuz, we doubt that the overall capability of Gulf states to export oil through pipelines will be expanded much this decade.

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Japanese Energy Security: Prospects and Implications

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Japan will remain extremely vulnerable to oil supply disruptions over the next two decades because of a lack of indigenous energy resources and prospects for slow growth in nonoil energy use. Imported oil will account for about one-half Japan's energy needs through the year 2000, and the bulk of Japan's oil supplies probably will continue to come from the politically unstable Persian Gulf.

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DI IEEW 83-017
29 April 1983

Secret

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The UK Market for Norwegian Gas: An Energy Security Issue

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Despite sharp reductions in industry forecasts of UK gas requirements, the United Kingdom still will need additional Norwegian gas in the early 1990s, and we expect London to compete aggressively with other West European countries for gas from Norway's Sleipner field. If the UK wins the bidding, as we now expect, we estimate that the British could have a small surplus of natural gas by the mid-1990s. The existence of a surplus raises the possibility of a pipeline to export gas to the continent, but we believe a number of political constraints must be overcome before London would permit gas exports.

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29 April 1983

Secret

25X1

**International
Economic & Energy
Weekly**

25X1

29 April 1983

Perspective***Energy Security: Still a Major Issue***

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Weak energy demand, declining oil prices, and substantial surplus capacity to produce oil, gas, and coal have led many observers to claim that the energy crisis is over. Most recent industry forecasts indicate that energy supplies should be ample to prevent a return of sharp price increases and the resultant slowdown in economic growth for the balance of the decade. These same forecasts indicate that surplus capacity will be gradually eroded over the balance of the 1980s, leaving the market increasingly vulnerable to an oil supply disruption. At the same time, dependence among OECD countries on oil imports from the Middle East will remain sizable, and Western Europe is expected to increase its imports of natural gas. As a result, we believe that energy security will continue to be an important issue for some time to come.

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Great strides have been made in limiting energy use, especially oil, in OECD countries following the price shocks of the 1970s. Total energy use in 1981 was virtually the same as in 1973 despite real GNP growth that averaged 2.4 percent annually over the period. Oil use has actually declined about 10 percent since 1973. Even so, import dependence among OECD countries remains substantial. Western Europe still relied on imports for more than 40 percent of energy requirements in 1982; for Japan, the level of dependence exceeded 80 percent. Dependence on imported energy is unlikely to change much over the balance of the decade, according to industry forecasts. By 1990, Japan will still rely on imports for over 80 percent of energy requirements and imports will supply 40 to 50 percent of West European needs as growing gas imports offset a decline in oil dependence.

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As a result, both regions will remain highly dependent on the volatile Persian Gulf area, where 60 percent of Free World oil reserves are located and where nearly one-fourth of non-Communist oil supplies pass through the Strait of Hormuz. The high concentration of oil facilities in the Persian Gulf makes the area's energy supplies extremely vulnerable to acts of sabotage, revolution, or war. Although the odds are against a major internal or external disruption of oil exports from any particular exporting nation or region, the probability of some sort of disruption occurring is quite high. Since 1950, for example, oil supplies from major exporting countries have been disrupted on 14 separate occasions. Moreover, while the United States currently relies on imports for only about 30 percent of total oil needs, we would not be immune from the price impacts of an oil supply disruption.

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DI IEEW 83-017
29 April 1983

Secret

The expected increase in reliance on natural gas imports in Western Europe threatens to raise some additional security problems. Unlike oil, gas supplies are relatively inflexible because of the transmission and distribution systems used for delivery. As a result, a gas supply shortfall cannot be easily offset by shifting to supplies from other sources. To minimize the potentially damaging effects of a gas supply cutoff, purchasers must add to storage facilities, increase dual-fired capability, and maintain surge production capability in domestic gasfields or from import sources. Otherwise, suppliers such as the Soviet Union—which probably will be supplying more than 30 percent of gas needs in France, West Germany, and Italy by 1990—could cause serious economic difficulties by cutting off gas deliveries. [REDACTED]

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The threat of energy supply disruptions poses additional problems for the United States beyond the risk of higher prices, reduced economic growth, more rapid inflation, and higher unemployment. Other importers—especially Western Europe and Japan—probably will remain reluctant to actively support certain US positions in negotiations with energy producers so long as they remain heavily dependent on imported energy. Concern over energy security is also likely to cause several foreign governments to intervene in the marketplace and impose artificial restraints such as price ceilings whenever a disruption or the threat of a loss of supplies occurs. [REDACTED]

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There are several steps which our Allies can take to reduce the threat of supply disruptions from non-OECD exporters of both oil and natural gas:

- Diversify imports away from potentially unstable sources of supply.
- Increase government-owned stockpiles of oil.
- Encourage the development of indigenous resources, especially natural gas in Western Europe.
- Limit dependence on any single source of natural gas by factoring in the cost of needed security measures into the price of these supplies.
- Develop greater linkage between gas pipeline systems in Western Europe, including a hookup between the now physically separate UK and continental gas markets.

Whether these actions are undertaken will depend in large part on the premium buyers are willing to pay for energy security. The costs of the supply disruptions of the 1970s are still being paid. A disruption in the late 1980s could be even more costly, especially if Moscow chose to take advantage of its growing presence in the West European gas market. [REDACTED]

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29 April 1983

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Briefs**Energy***Recent Oil Price Developments*

In response to the recent firming of spot crude oil prices, Egypt and the Soviet Union announced this week an increase in their official oil prices of about \$0.50 per barrel effective 1 May. Spot prices for most crudes are now near official prices as a result of dwindling oil stocks and strict adherence by OPEC members to recent production and pricing guidelines. Decisions by two OPEC members—Libya and Iran—to cut back sharply on spot sales have also helped firm spot prices. Some industry analysts believe crude oil prices have stabilized, but prices could weaken again if OPEC members—most of whom are still producing well below desired levels—attempt to increase production significantly in coming months without a corresponding increase in oil consumption. [redacted]

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Iraq Compensates Creditors With Oil

Iraq is using crude oil provided by Saudi Arabia to help pay foreign contractors, [redacted] Japanese, Korean, and French firms have agreed to take a combined total of about 180,000 barrels per day of Saudi crude. The deliveries to France reportedly are to help finance Iraqi purchases of French arms. The Saudi oil, worth about \$160 million monthly, will not prevent Iraqi import cuts, however; over two-thirds of the revenue will be needed just to offset the \$5-per-barrel decline in the price of Iraqi crude resulting from the recent OPEC price reduction. Iraq cannot offset this price decline by exporting more because its only oil export route is the 700,000-barrel-per-day Turkish pipeline, which already is operating at near capacity. [redacted]

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Libya Halts Oil Barter Arrangement With USSR

[redacted] Tripoli has informed Moscow that effective 1 May it will revert to paying debts in cash rather than bartering its crude oil. Moscow previously has preferred cash payments, but last year the USSR accepted large amounts of discounted Libyan oil instead of cash to cover payments on Tripoli's overdue debt for arms purchases. Libya has been displeased with this temporary arrangement because the Soviets were dumping much of their Libyan crude entitlement on the spot market at prices that undercut Libyan sales. [redacted]

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Although Libya frequently has violated OPEC guidelines on production, Tripoli's decision to halt its barter agreement with the USSR and phase out processing arrangements with West European refiners will improve the chances of success for the cartel's current production and pricing structure.

Secret

29 April 1983

Secret

Recent firming of spot prices for Libyan crudes to about \$29 a barrel has already encouraged foreign companies operating in Libya to resume lifting their entitlements and has raised production to 1.1 million b/d in April—Libya's OPEC quota. [REDACTED]

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***Iranian-Japanese Oil
Contract Negotiations***

Tehran's insistence on maintaining official oil prices has prompted Japanese buyers to break off negotiations on contract renewals and leaves Japanese purchases at 110,000 b/d, or half the previous level. Several of the remaining contracts, which will expire soon, remain in doubt because Japanese firms want a sizable discount to compensate for higher insurance and transport costs. Tehran, however, believes that its official price of \$28 for Iranian Light crude is sufficiently below other similar Gulf crudes to remain competitive and has recently stopped selling its crudes to traders and refiners at discounted prices. In part as a result of this measure, Iranian spot prices have now risen close to official prices. If these conditions persist, some Japanese customers probably will renegotiate contracts for smaller volumes later this year. [REDACTED]

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***Thailand's Natural Gas
Problems Continue***

Under pressure from PTT, Thailand's national petroleum authority, Union Oil has agreed to accelerate development of the Baanpot natural gas field. PTT officials have been concerned that production from Erawan, Thailand's only operating natural gas field, continues at less than one-half the projected rate of 7 million cubic meters per day despite attempts by Union Oil to boost production. PTT now expects the Baanpot field—originally scheduled to begin production in mid-1985—to flow at a rate of 0.8 to 1.1 million cubic meters per day by the end of this year and 1.4 to 1.7 million cubic meters per day by mid-1984. We believe this estimate is optimistic, however. [REDACTED]

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[REDACTED] the Baanpot field—as well as others in the Gulf of Thailand yet to be developed—may have problems similar to those at Erawan. Union claims that Erawan's natural gas reserves are found in many small, unconnected pools rather than in one large deposit and are thus more difficult to extract.

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International Trade, Technology, and Finance

***Soviet-US Grain Trade
Prospects***

The USSR has not yet responded officially to the US offer to renegotiate the Long-Term Grain Agreement, but Soviet officials have indicated they are interested in a new agreement. The current agreement expires on 30 September. Before the US announcement, a Soviet trade official claimed the US acreage reduction programs have heightened Soviet concerns about the long-term availability of grain supplies. [REDACTED]

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29 April 1983

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these purchases were being delayed to help encourage the United States to negotiate a new grain accord. So far the Soviets have purchased an estimated 34 million tons of grain from all sources for delivery by 30 June. It is not known how much, if any, additional US grain the Soviets intend to buy. []

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While the poor winter crop outlook may prompt the USSR to buy more grain over the next several weeks, it probably has little bearing on Moscow's desire to replace the Long-Term Agreement. Some grain traders who have dealt extensively with Soviet buyers believe the USSR would be willing to increase the existing minimum purchase level of 6 million tons of US grain by 2 to 4 million tons. Such an expansion, combined with supplies under agreements with non-US exporters, would ensure Moscow about 20 million tons of grain annually over the next several years. []

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*China Seeking US
Textile Machinery*

China's State Council this month cited textile machinery along with large integrated circuits as key products that require upgrading during the Sixth Five-Year Plan (1981-85), a move that could benefit US firms. Officials of one province recently justified the purchase of a used US cotton mill by saying that obtaining Chinese-made equipment would have delayed production by at least a year and that Western equipment is more dependable. Most of China's imports of new textile machinery still come from Italy and Switzerland, but the Chinese now are also negotiating with a US firm for technology to produce industrial sewing machines for both domestic use and export. []

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*West German-US
Dispute Over Specialty
Metals*

West German irritation over US legislation restricting West European exports of specialty metals to the United States is prompting consideration of retaliatory measures. [] the Bundestag may impose countermeasures that could prevent the West German armed forces from purchasing an estimated \$10 billion worth of US-made military equipment during the next 10 years. [] legislation that risks such a large volume of business for about \$15 million worth of specialty metals formerly sold annually to the United States by West German firms. []

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The government's opposition to protectionist measures and its desire to avoid an open dispute with the United States make it unlikely that the Bundestag will enact sweeping retaliatory measures. As industry leaders increase pressure on the government to protect their access to the US specialty metals market, however, some purchases from the United States may be delayed or canceled as a warning. Most West German military officials would prefer US weapons, but many members of the Bundestag have a renewed interest in exclusively European arms cooperation. French industry in particular may try to use US-West German differences to promote Franco-German programs as an alternative to purchases from the United States. []

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*East European Trade
Surplus With
Nonsocialist Countries*

For the first time in nearly 20 years Eastern Europe recorded a trade surplus with nonsocialist, primarily OECD, countries. The seven nations of the region went from a \$5.1 billion deficit in 1981 to a surplus of \$1.4 billion in 1982. Yugoslavia and Hungary were the only countries that did not register a surplus. []

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**East European Trade
With Nonsocialist Countries**

Million US \$

	Exports			Imports			Trade Balance	
	1981	1982	Percent Change	1981	1982	Percent Change	1981	1982
Total	36,998	35,524	-4.0	42,098	34,147	-18.9	-5,100	1,377
Bulgaria	3,198	3,195	-0.1	2,546	2,572	1.0	652	623
Czechoslovakia	4,281	4,099	-4.3	3,989	3,598	-9.8	292	501
East Germany	6,714	7,048	5.0	6,654	5,763	-13.4	60	1,285
Hungary	3,652	3,801	4.1	4,442	4,144	-6.7	-790	-343
Poland	5,431	5,197	-4.3	5,366	3,723	-30.6	65	1,474
Romania	7,281	6,325	-13.1	7,065	4,710	-33.3	216	1,615
Yugoslavia	6,441	5,859	-9.0	12,036	9,637	-19.9	-5,595	-3,778
[]								

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The improvement in the balance of trade was due largely to a cutback in hard currency imports as Western banks refused to extend new credits to the region. In the cases of Poland, Romania, and Yugoslavia the reductions were massive, causing disruptions in industrial production and consumer supplies. Despite strenuous efforts to raise exports, Eastern Europe's hard currency sales fell by \$1.5 billion as a result of depressed markets in the West. Since Western banks remain reluctant to provide new loans and the countries face large debt service payments, the region probably will have to run a hard currency trade surplus again in 1983. Although economic recovery in the West will help raise exports somewhat, the need to hold down imports will place severe strains on economic performance. []

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Secret
29 April 1983

Secret

*Iranian-Syrian
Financial Arrangements*

Tehran reportedly has decided to forgive Syria's oil debt, estimated between \$750 million and \$1 billion. The Khomeini government's largess almost certainly is motivated by its desire to keep the Iraqi oil pipeline through Syria to the Mediterranean closed. Under the agreement signed in March 1982, Tehran supplies nearly 175,000 b/d of crude under generous terms. The first 100,000 b/d is sold for about \$25 per barrel while the price of another 55,000 b/d—to be repaid in Syrian products—is calculated at the full Iranian reference price of \$28 per barrel. A further 20,000 b/d is given at no cost. Even with these concessional arrangements, Damascus has been consistently in arrears on its payments for the oil, some of which is reexported and some is used to mix with Syria's domestically produced high sulfur crude.

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*Guatemala Reaches
Preliminary Agreement
With IMF*

The IMF expects Guatemala to sign a letter of intent within a month for a \$125 million standby loan that would begin to ease the country's acute foreign exchange shortage. Although this action will pave the way for some World Bank financing, foreign bankers probably will continue to be wary of resuming lending to Guatemala any time soon. A key feature of the IMF program, which could begin as soon as July, is a new value-added tax to replace a number of sales and foreign trade taxes. The agreement calls on Guatemala to achieve a payments equilibrium by the end of the 18-month accord, gradually eliminate the \$350-450 million in arrears on foreign obligations, and reduce the fiscal deficit moderately. Despite Guatemalan fears, the IMF has not mandated that the government devalue the currency, possibly because Guatemalan exports have been crippled more by regional turmoil and low world commodity prices than by an erosion in international competitiveness.

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National Developments*Developed Countries**Canadian Budget
Announced*

The new federal budget introduced by Finance Minister Marc Lalonde on 19 April is designed to promote economic recovery by combining moderate spending with strong tax incentives to encourage private investment. The key to the budget is a four-year Special Recovery Program that commits \$3.9 billion to capital investment and public works projects. Thirty percent of the money allocated to this program will be spent in the 1983/84 fiscal year, increasing projected real government expenditures by 2 percent. Moreover, Lalonde has postponed until the fall of 1984 planned increases in the federal sales tax from 9 percent to 10 percent and in taxes on alcohol, cigarettes, and cable TV. As a result, the projected budget deficit for the current fiscal year has been increased to \$25.3 billion, over 8 percent of Canadian GNP.

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29 April 1983

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The budget's decidedly probusiness orientation represents a significant departure from the Liberal tradition of large-scale government involvement in the economy and has been widely characterized as a "Tory budget." In extensive talks with business leaders before the budget announcement, Lalonde was cautioned not to introduce too stimulative a budget that would serve only to re-inflate the economy. He appears to have come up with a budget that gives a little to everyone, emphasizes the key role of the private sector in the recovery, and keeps the deficit within an acceptable limit. This probably will be the last full budget before elections—which may take place as early as next spring—and should bolster the Liberals' sagging position in the polls. [REDACTED]

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*Japanese Electronics
Firms Seeking Favors
From Tokyo*

The Japanese Electronics Industry Association (EIA) has apparently blocked the Ministry of Finance's attempt to force repayment of the government subsidies used to finance the development of advanced electronics and is now trying to shorten depreciation schedules for new capital equipment. During the 1970s, major electronics producers received large research and development loans subject to repayment only if the research yielded profitable products within five years. Of over \$200 million in loans to six semiconductor manufacturers between 1972 and 1976, only \$1.3 million had been repaid by April 1980. To recover a larger share of subsequent loans from the now profitable industry, the Finance Ministry had wanted the loans repaid if the research showed profits in eight years. [REDACTED]

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Less Developed Countries

*Continuing Financial
Problems for Brazil*

The continued shortage of liquid funds is causing Brasilia to delay repaying debts falling due and to seek another multibillion-dollar loan to avert a moratorium. With reserves depleted, Brasilia is selectively delaying payments on debts and for imports, raising its commercial overdue debts to nearly \$900 million. [REDACTED] Petrobras—Brazil's oil company and most creditworthy borrower—missed \$180 million in payments due to US banks last week. The US Embassy reports private bankers are not yet honoring pledges to restore \$3 billion in short-term credits Brazil needs to meet its cash requirements. Brazilian borrowers are paying unusually high interest rates for new short-term loans and to refinance old loans. [REDACTED]

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Commercial bankers are refusing new loans because public speculation is growing that Brasilia will soon declare a moratorium on debt repayments. The government is trying to avoid this, and the delays in making payments

Secret
29 April 1983

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probably are intended as a warning to bankers that a suspension of payments will be the next step. Although aimed at pressing bankers to meet financial commitments, the selective delays in repayments could backfire. Growing overdue debts could cause lenders to stop new credit disbursements altogether, thereby making Brazil's financial problems even more intractable. [REDACTED]

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Cuban Hard Currency Problems

Cuba apparently is being forced to find new Western suppliers as a result of its recent debt rescheduling. Japan—Cuba's major Western trading partner and principal source of high-quality capital goods and raw materials—rescinded official credits for exports to Cuba following Havana's debt rescheduling request and is refusing to write new export insurance. [REDACTED]

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[REDACTED] With Cuba's hard-currency shortage precluding significant cash purchases, the Castro regime will have to turn more to Bloc countries for essential imports or locate Western suppliers willing to offer easy credit terms. The wariness of private lenders probably will prevent Havana from obtaining large new short-term loans to finance imports. [REDACTED]

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Ghana's New Budget Stirs Dissatisfaction

The announcement this week of Ghana's long-awaited 1983 budget eliminates the major stumblingblock to continued negotiations for an agreement with the IMF. Ghana is counting on the Fund to provide roughly \$195 million and to pave the way for Western bank credits. The government projects a \$750 million financial gap for this year. The budget, which addresses the Fund's primary concern that the currency was overvalued, provides for an import surcharge and export bonus schemes, in effect devaluing the cedi by nearly 90 percent. Other provisions include sharp price increases for such staples as gasoline, beer, and cigarettes, but Accra is holding firm on food prices, which are already at very high levels. [REDACTED]

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The US Embassy reports that the shaky Rawlings government could find implementation of the budget a difficult task. [REDACTED]

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the price increases have intensified antigovernment sentiment among civil servants and the military, and Ghana's internal security organization is concerned that possible civil protests could lead to a coup attempt. [REDACTED]

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Zimbabwe Extends State Control

Prime Minister Mugabe's recently announced plans to acquire controlling interest in the fuel procurement, transport, and corn milling industries is likely to reinforce wariness on the part of foreign investors uncertain about government treatment of private industry. The impact of the announcement, moreover, probably has been heightened by Mugabe's recent criticism of some

Secret

29 April 1983

Secret

cabinet ministers for a "hypocritical commitment" to socialism. Zimbabwe can ill afford to scare off private capital. The country ran an estimated \$650 million current account deficit in 1982, and recent reporting suggests output may decline by as much as 3 percent this year. [REDACTED]

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Trinidadian Economic Problems

Preliminary figures for last year show a decline in foreign reserves for the first time in eight years and a budget deficit equal to 20 percent of GDP as compared to a small surplus in 1981. Although falling oil revenues were offset by a hike in personal income taxes, current budget expenditures soared 76 percent, mostly because of a 35-percent pay raise for civil servants. The US Embassy believes that Trinidad's estimate of nearly 4-percent real economic growth for last year is overly optimistic and expects that cuts in government subsidies and utility rate hikes this year will drive inflation well beyond the officially predicted 18 percent. The country's economic difficulties already have raised fears of widespread layoffs—the unemployment rate probably exceeds 15 percent—and rumors of an imminent currency devaluation. [REDACTED]

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Pakistani Labor Problems

The Chairman of the Pakistan Shippers Council has asked President Zia to intervene immediately to end a dockworkers' slowdown at Karachi. The slowdown, which began on 30 March, has cut cargo handling in the port by roughly 60 percent. Moreover, because of long waiting times to load or unload, shippers are debating a port surcharge that would raise the cost of imports and exports. Exporters already fear that buyers will soon start canceling orders because they are unable to meet current commitments. Meanwhile, negotiations on the 50-percent wage increase demanded by dockworkers are at a standstill because management wants workers to resume normal operations before resuming talks. [REDACTED]

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Communist

CEMA Negotiations for a Summit

A high-level Soviet delegation visited Bucharest earlier this month and discussed preparations for the still-unscheduled CEMA summit. Bucharest radio has reported that the talks with President Ceausescu dealt with the need to expand cooperation within CEMA and the question of energy and raw material supplies. The delegation also visited Budapest. Meanwhile, a leading Soviet expert on CEMA said the summit will react in part to developments at the Williamsburg summit late next month. The delegation probably sought to persuade Romania and Hungary to drop their opposition to closer integration, but the effort is unlikely to have succeeded. Moscow apparently is waiting to see what policy emerges at Williamsburg before further defining its views on trade ties with the West. [REDACTED]

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Secret
29 April 1983

Secret

*China Seeking Foreign
Investment in Nonfer-
rous Metals*

Beijing last month established the China Nonferrous Metal Industry Corporation to accelerate the exploitation of China's abundant resources of nonferrous metals. The corporation's director has announced that foreign firms will be approached to help develop copper, aluminum, lead, and zinc mines and smelters and that China would attach the same importance to such development as it does to the coal industry. Foreign participation may consist of joint ventures or compensatory trade, and loans at favorable terms would be accepted in the technical upgrading of some 819 enterprises.

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Algerian Gas Export Shortfalls: An Energy Security Issue

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Serious production problems in its major gasfields will prevent Algeria from being able to meet about one-half of its annual gas export commitments to Western Europe and the United States during the remainder of the decade. This shortfall will reinforce West European views of Algeria as an unreliable supplier. As a result, gas purchasers will be less willing to sign new contracts for Algerian gas during the 1990s, opening new opportunities for the Soviets and others to capture any growth in import demand in the European market.

of NGLs were planned, which would largely offset the decline in oil exports during the early years of the program.

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In 1979 the new government headed by President Chadli publicly indicated that the gas development program was technically and financially more than Algeria could handle. As a result, the program was substantially cut back. According to the revised plan, marketable production would total about 50-60 bcm annually by 1983; about 38 bcm of natural gas would be available for export. With this volume in mind, Algeria finalized contracts with France, Belgium, Spain, Italy, and the United States. Although price remained an issue in some instances, buyers were informed that they could count on Algerian supplies at least through the 1980s.

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Gas Development Plans

Shortly after the nationalization of the oil industry in the early 1970s, the Algerian Government drew up plans for a major hydrocarbon development program. The program was designed to bring major gas deposits into production by the early 1980s when oil production was expected to begin declining. The 1977 Algerian Energy Plan centered on development of the Hassi R'Mel Gasfield, a super-giant field that holds approximately 60 percent of Algeria's natural gas reserves of 3.2 trillion cubic meters, the equivalent of 20 billion barrels of oil. The remaining reserves, located in numerous smaller reservoirs in the south, were to be developed by the mid-1980s.

Problems at Hassi R'Mel

Recently completed studies for the Algerian State Oil and Gas Company (Sonatrach) indicate that Algeria cannot fill even the scaled-back production and export program for the 1980s. The main problem is that Hassi R'Mel is far more geologically complex than was thought earlier. Recently discovered structural faults and shale barriers, for example, are hampering the \$1 billion gas reinjection and recycling program Sonatrach has been using to recover condensates and liquefied petroleum gases from the field.¹ The 50 injection wells already in place are blocked off from some of the 150 producing wells by these barriers. To correct

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According to the 1977 plan, Algiers intended to produce up to 110 billion cubic meters (bcm) of natural gas annually during the latter half of the 1980s, of which about 70 bcm would be exported, mostly to Western Europe. Algiers also planned to develop the large amounts of natural gas liquids (NGLs)—totaling some 6 billion barrels—contained in its gasfields. Through gas reinjection and recycling operations, recovery of up to 500,000 b/d

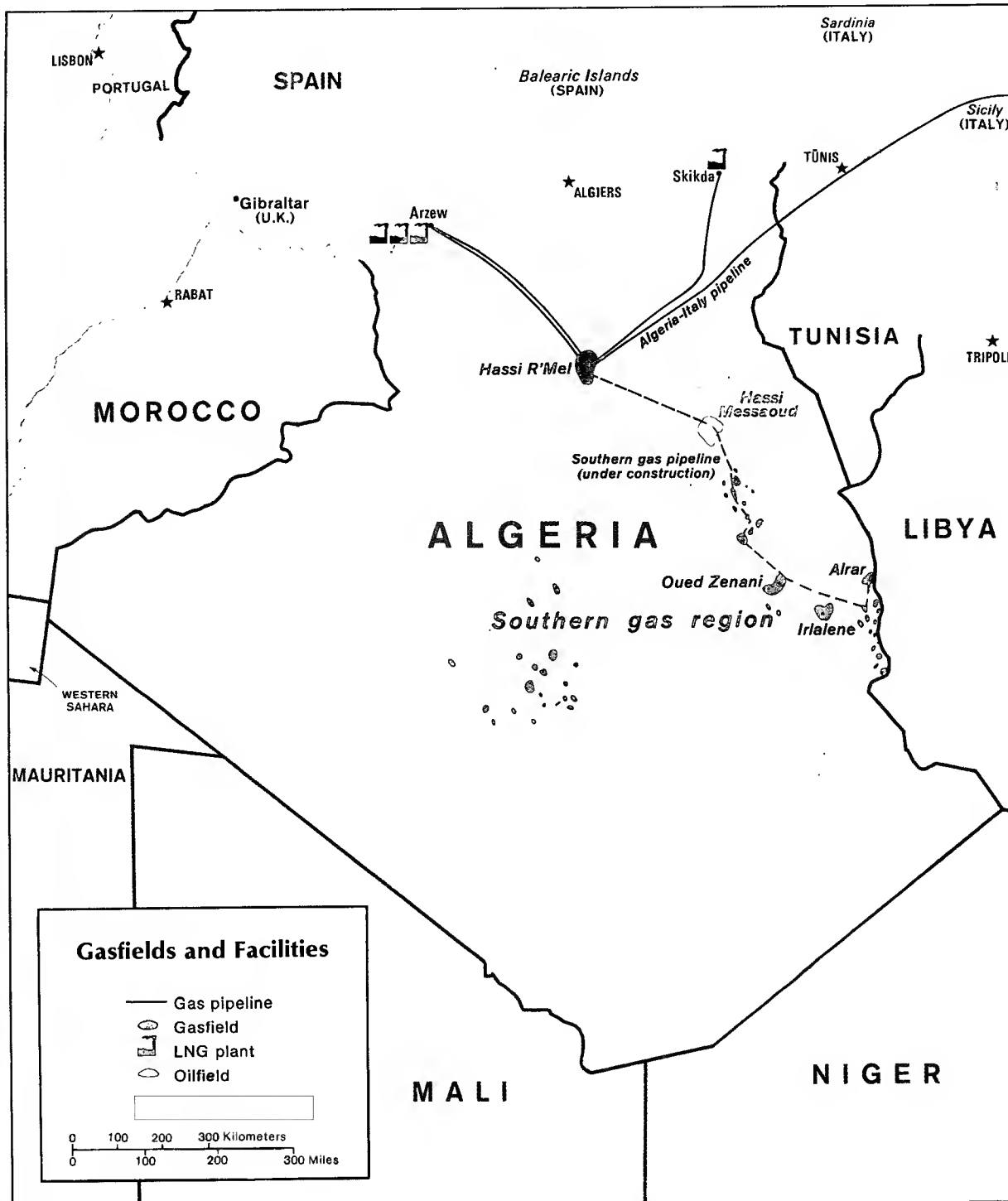
¹ The gas recycling program removes natural gas liquids (condensate, propane, and butane) from produced "wet" gas at the surface and reinjects the remaining dry gas into the reservoir to maximize ultimate NGL recovery.

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DI IE EW 83-017
29 April 1983

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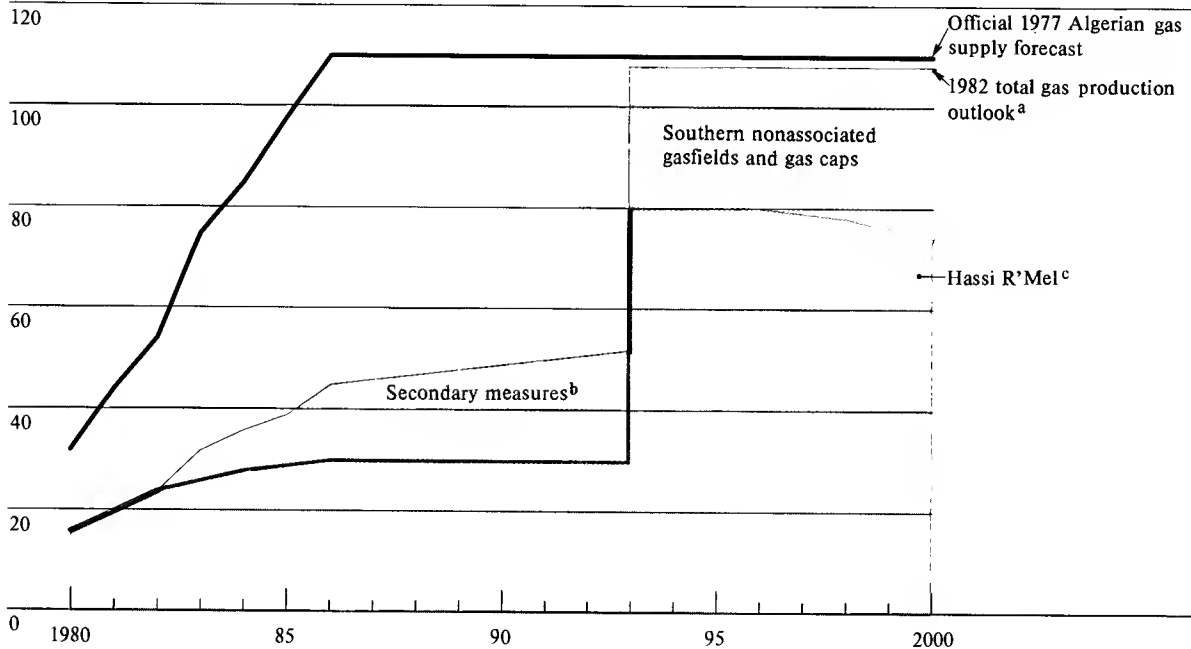
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29 April 1983

Secret

Algeria: Gas Production Outlook

Billion cubic meters

^a CIA estimate based on recent Sonatrach studies.^b Secondary measures: include Hassi R'Mel gas reinjection at 50% of gross production, associated gas production, limited development of southern gasfields and gas caps, and reduced domestic consumption.^c Hassi R'Mel marketable production, assuming 70% gas reinjection until 1993 when reinjection program ends.

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this situation, surface facilities must undergo major modifications, and new wells have to be drilled within the faulted areas. An engineering study completed two months ago also indicates significant water encroachment into the field, which compounds these problems.

As a result of these factors, the availability of marketable natural gas has fallen far below expectations. Last year, for example, marketable gas production amounted to roughly 25 bcm, less than half the volume called for in the Algerian program. The production shortfall last year held Algeria's

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exportable gas surplus to only about 8 bcm. Although well below the level Algeria said it could deliver, the export gap did not surface as an issue with customers because the current recession has lowered West European natural gas demand. []

Algeria's Options

[] Sonatrach is considering several options to boost production and to overcome the export shortfall. The easiest and quickest way for Algeria to meet its export commitments would be to eliminate gas reinjection at Hassi R'Mel. This would free up about 30 bcm of gas for export. By eliminating gas reinjection, however, Algeria would have to forgo its plan to develop most of the field's NGLs. The eventual loss of about \$20 billion in potentially recoverable NGLs makes this solution costly. []

The most economic, but technically difficult, solution would be to accelerate development of the southern gasfields and increase the number of wells in Hassi R'Mel. Development costs, however, would be high—we estimate \$9-10 billion for field and facility development. A minimum of some 400 new wells would have to be drilled or worked over in the southern gasfields, and another 200 wells would have to be drilled in Hassi R'Mel. []

[] Algiers lacks the skilled crews necessary to complete the drilling and field work in time to fulfill export commitments through the late 1980s without extensive foreign technical and financial assistance. []

Sonatrach is probably also considering a series of secondary options. Individually, each could supply only marginal amounts of additional gas for export and each has some drawbacks. These secondary options include:

- Decreasing gas reinjection at Hassi R'Mel from the current rate of 70 percent to 50 percent of gross production—considered by Sonatrach as

the minimum gas cycling level. This would provide another 10 bcm for export. Although about \$10 billion worth of NGLs would be lost over the longer term, Algeria would enjoy an immediate gain of \$1.5 billion annually in additional revenues from gas sales in the first few years.

- Utilizing currently flared gas. Algiers has recently decided to resume work on a \$1.5 billion gas pipeline that would tie in the southern associated fields by 1986. Fluctuations in oil production rates, however, could keep gas production below the maximum rate of 5 bcm.
- Production of gas from gas caps and small-scale development of the southern nonassociated gasfields. Although production from gas caps could provide up to another 5 bcm for export, some loss in oil recovery would probably occur. Limited drilling of new gasfields could add 5-10 bcm over several years for export. Any production from gas caps and the southern gasfields must, however, await completion of the southern gas pipeline in 1986.
- Slowing the growth in domestic gas consumption and reducing gas losses could increase the amount of gas available for exports perhaps by another 5 bcm per year. []

Algiers' Likely Course of Action

We believe Algerian leaders have only recently become aware of the extent of the gas production problem. Several engineering and marketing studies are now being undertaken by Sonatrach and foreign consultants to examine the production problems further. []

Algiers faces financial problems that limit its options. Borrowing to finance new development would be a difficult choice; Algerian debts already total over \$17 billion, and Algiers has only recently succeeded in reducing its debt service ratio to less than 25 percent, []

. In

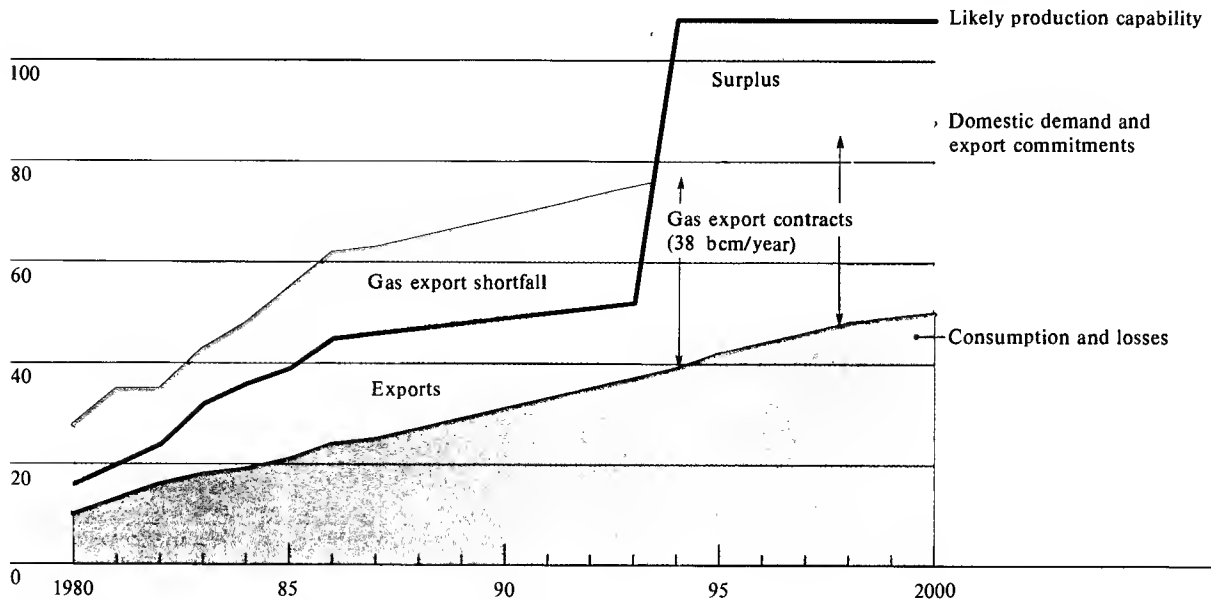
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29 April 1983

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Algeria: Potential Gas Export Shortfalls^a

Billion cubic meters

120



^a Period from 1980 to 1982 are actual rates, after 1982 our estimates are based on Sonatrach studies.

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addition, the decline in oil revenues resulting from lowered prices will aggravate the problem of apportionment of scarce funds for politically sensitive housing and services programs. [REDACTED]

Because of the financial constraints, Algiers is unlikely to implement either of the two major options that would enable it to meet all of its commitments. We believe Algiers will not cut back substantially on gas reinjection to avoid the substantial loss in NGL revenues later in the decade. With oil production on the decline, revenues from NGL production will be needed. Algiers probably cannot significantly accelerate southern gasfield development in the near term because of the high cost and a lack of domestic technical capabilities.

In addition, Algiers is reluctant, for political reasons, to accept the level of foreign assistance necessary for accelerated development of new gasfields. [REDACTED]

Given these factors, we believe that the Algerians will opt to implement some of the less costly secondary solutions to increase the amount of gas available for export. They will probably eliminate the flaring of associated gas by 1986 and slow the growth of domestic gas consumption. Some reduction in gas reinjection may also be decided upon, but only within narrow limits because of the potential impact on future recovery of NGLs. On balance, we believe that these measures would probably increase the amount of gas available for export

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Algeria: Current Gas Contracts ^a

	Current Contracts ^b (bcm/year)	Deliveries ^c 1 Jan 83 (bcm/year)	Price ^b 1 Jan 83 (US \$ per million BTU)	Average Delivered Price ^d (US \$ per million BTU)	Comments
Total	37.85	15.9			
LNG	22.3 to 24.8	15.9			
Belgium	2.5 to 5.0	1.5	4.77	5.60	Deliveries of 2.5 bcm initiated in November 1982 with an option to increase to 5 bcm in 1986.
France	9.4	9.0	4.77	5.55	
Spain	4.5	0	3.85	4.35	Suspended November 1982 when Algiers raised prices to \$4.77.
United States	5.9	5.4			
Distrigas	1.4	1.4	3.60	5.60	Prices tied to fuel oils. Submission of new pricing formula postponed indefinitely.
Trunkline	4.5	4.0	3.60	6.65	Deliveries began in November 1982.
Pipeline	13.05	0			
Italy	12.0	0	4.41 ^e	5.41 to 5.71	Deliveries scheduled for June at 4 bcm, rising to 12 bcm by 1986.
Tunisia	1.0	0	NA	NA	Deliveries as part of transit fee to Italy
Yugoslavia	0.05	0	NA	4.65	

^a As of 1 March 1983.^b At Algerian border. 1 June price expected to fall \$0.50-0.60 per million BTU.^c Deliveries converted to an annual rate.^d Price at major consuming area within importing country (that is, Brussels, Paris, Barcelona, Boston, Midwest, Naples, and Bologna).^e Based on late September 1982 agreement.

to about 20 bcm annually. If Algeria adopted all of the secondary solutions considered by Sonatrach, we estimate exportable supplies could reach perhaps 30 bcm by the mid-1980s. Even in these circumstances, however, Algiers would be able to deliver only about three-fourths of the export volumes now under contract.

Gas Pricing Tactics

Faced with limitations on its production and export capabilities, Algiers has allocated its available natural gas exports to the highest bidders. Although Algiers has moderated its pricing demands in response to sharply falling gas consumption in Western Europe during the past two years, the

Secret

29 April 1983

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price of Algerian gas is still high compared to other gas sources. Delivered prices of Algerian gas in Western Europe during January 1983 averaged about \$5.60 per million BTU, compared with the delivered price of \$4.70 for Soviet gas. US delivered prices for Algerian gas were between \$5.60 and \$6.65 per million BTU, compared with about \$5.00 for Canadian and Mexican gas. Following the recent oil price cuts in April, most gas prices, including Algeria's, should fall by about 50 cents per million BTU by midyear. [REDACTED]

Although Algeria's tough line on pricing and the recent decline in European gas use led customers to accept reduced contract shipments, the major buyers are still talking about sizable deliveries of Algerian gas as the decade proceeds:

- The French utility, Gaz de France, expects to receive 9 bcm annually from Algeria through the 1980s and has agreed to take-or-pay pricing provisions under which it must take full delivery even during periods of slack demand.
- Belgium's Distrigaz has signed an agreement for at least 2.5 bcm for 20 years with an option to raise the total to 5 bcm.
- Italy has contracted for pipeline deliveries averaging about 6 bcm annually for the next three years and 12 bcm annually beginning in 1986.
- In the United States two companies have long-term supply contracts committing Algeria to deliver a total of almost 6 bcm annually well into the 1990s.

Smaller volumes of gas are scheduled for delivery to Yugoslavia and Tunisia by way of the Algeria-Italy pipeline. [REDACTED]

The Algerian Government probably will continue its aggressive pricing policy with an eye toward selling available supplies to the highest bidder. [REDACTED]

[REDACTED] Spain ceased buying Algerian gas in late

1982 when Algiers raised prices to \$4.77 from \$3.85 per million BTU. According to press reports, Belgian officials have hinted that they will not take up the 1986 option for an additional 2.5 bcm that is called for in Belgium's current contract with Algiers. [REDACTED]

We believe Algiers has set its sights on securing 20-30 bcm in contracts with take-or-pay provisions. This would guarantee Algeria a market for the volume of natural gas that, in our estimation, the government thinks can be supplied. [REDACTED]

Implications for Western Europe

Considering the actions taken by Spain and Belgium, we believe the Algerian pricing strategy is reinforcing the view among West European buyers that Algeria is not a reliable source of natural gas supplies. This view will be strengthened once Algeria's production problems become known. We believe that the Algerian Government has thus far managed to keep news of the supply problem tightly held. [REDACTED]

The growing view that Algeria is an unreliable supplier is benefiting the Soviets in dealings with West European buyers. [REDACTED]

[REDACTED] Madrid, for example, is now considering purchasing some Soviet gas, in part to offset its suspended deal with Algeria for 4.5 bcm. Belgian officials have also indicated that they would look for an alternative to the additional 2.5 bcm of gas they could buy from Algeria in 1986 under the terms of their present contract. As things now stand, the USSR will be in a good position to provide these additional supplies. [REDACTED]

Impact on the United States

Although Algiers is currently exporting full contract volumes of nearly 6 bcm to US customers Distrigas and Trunkline, a failure to secure gas prices comparable to those paid by West European

Secret

29 April 1983

Secret

customers probably will induce Algeria to curtail these deliveries when shortages develop. Algeria also is likely to favor some West European customers because of greater profits (resulting from lower transportation costs) and closer political and trade ties. Although curtailment could hurt some US gas companies, US dependence on Algerian gas is currently negligible, and sufficient supplies would be available from other sources, especially Canada.

[redacted]

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Beyond 1990

With the scheduled completion of the NGL recovery program in the mid-1990s, Algeria should be able to meet gas export commitments of 38 bcm. Development of the southern gasfields, as planned, could further provide Algiers with an exportable gas surplus of about 20 bcm annually after 1995, bringing total export availability to 55-60 bcm. This surplus could be exported by adding compressors to the Algeria-Italy pipeline or by constructing additional pipelines to Italy or Spain. Despite industry forecasts of an increase in gas import demand, however, we believe most European customers will be inclined to forgo additional volumes of Algerian gas in the 1990s because of concern over Algeria's reliability as a supplier. The issue of reliability includes price assurances—that is, Algeria's willingness to stick with a contracted price schedule. From this perspective, the West Europeans may well view the Soviets as a more secure source of supply for the 1990s.

[redacted]

[redacted]

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Secret
29 April 1983

Secret

Oil Transport From the Persian Gulf: An Energy Security Issue

Continuing dependence on Persian Gulf oil and the uncertain political climate in the Middle East underscore the potential for a major disruption of non-Communist oil supplies. The Persian Gulf currently supplies more than one-fourth of the West's oil needs; this share is likely to grow due to the region's large reserves. While Gulf States have considered building additional crude oil pipelines to bypass the vulnerable Strait of Hormuz, we doubt that the overall capability of Gulf states to export oil through pipelines will be expanded much this decade.

Western Dependence on Persian Gulf Oil

Western dependence on oil imports from the Persian Gulf is substantial. Last year Gulf states produced about 12.8 million b/d of crude oil and

natural gas liquids (NGL). OECD countries imported 7.8 million b/d of oil and petroleum products in 1982 from the Gulf, amounting to about 25 percent of their total oil consumption. While less than 20 percent of the US oil imports came from the Persian Gulf, Gulf oil accounted for more than 30 percent of West European imports and nearly 60 percent of Japanese imports.

Large oil reserves in the Persian Gulf states suggest that a major share of non-Communist supply will continue to come from this region. According to some forecasts, OPEC is expected to provide about one-half of the West's oil consumption in 1990; more than 60 percent of this will come from the Persian Gulf. The United States will continue to rely less heavily on Gulf oil than other major importers because of higher imports of Mexican and North Sea oil. According to International Energy Agency projections of oil requirements,

Non-Communist Dependence on Persian Gulf Oil ^a

*Thousand barrels per day
(except where noted)*

	1982 ^b			1978			1973		
	Persian Gulf	Total Imports	Percent	Persian Gulf	Total Imports	Percent	Persian Gulf	Total Imports	Percent
United States	842	4,782	18	2,602	8,364	31	1,380	6,256	22
Japan	2,708	4,625	59	3,853	5,347	72	4,100	5,576	74
Western Europe	4,078	13,120	31	8,455	13,128	64	10,807	16,714	65
Of which:									
France	924	2,033	45	1,749	2,494	70	1,893	2,875	66
Italy	802	2,040	39	1,437	2,362	61	1,739	2,669	65
United Kingdom	357	964	37	966	1,596	61	1,793	2,749	65
West Germany	446	2,217	20	886	2,848	31	1,307	3,001	44

^a Includes imports of crude oil and refined products, including natural gas liquids.

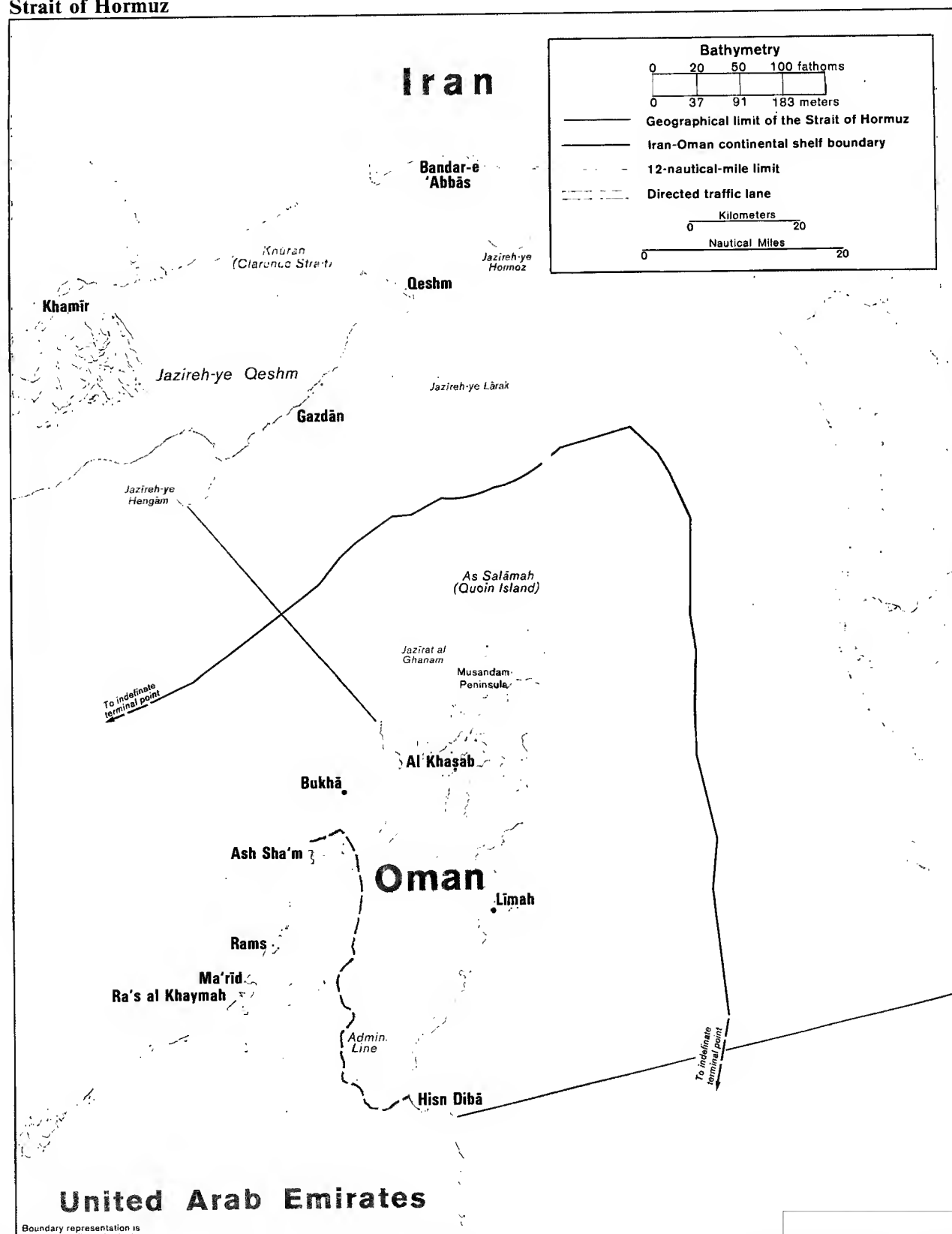
^b First half of 1982.

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29 April 1983

Secret

Strait of Hormuz



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Persian Gulf Oil Export Pipelines*Million barrels per day*

	Nominal Capacity	Current Capacity		Capacity in 1990	
		Effective Capacity	Average 1982 Volumes	Low Estimate	High Estimate
Existing pipelines					
Iraq-Syria-Lebanon	1.2	1.05 ^a	0.1 ^b	1.2	1.2
Iraq-Turkey	0.7	0.7 ^c	0.65	0.98	0.98
Tapline	0.5	0.25	0.05 ^d	0.1	0.5
Petroline	1.85	1.85	1.1	1.65 ^e	3.5
Total	4.25	3.85	1.90	3.93	6.18
Proposed pipelines					
Iraq-Saudi Arabia				0	1.6
Persian Gulf-Oman				0	1.0
Total				0	2.6
Total throughput capacity in 1990				3.93	8.78

^a Estimated on the basis of possible export capacity restrictions at the port of Baniyas.

^b Represents the average for the full year; the pipeline was actually shut down in April.

^c Capacity currently being expanded by 280,000 b/d.

^d Tapline only exported to Jordan in 1982.

^e Export capacity; figure excludes an estimated 200,000 b/d for the Yanbu al Bahr domestic refinery, which will provide products for Saudi internal consumption.

Japan and Western Europe will depend on Persian Gulf oil for roughly 60 and 40 percent, respectively, of their total petroleum imports in 1990. These forecasts expect the Persian Gulf to supply at least 10-11 million b/d of crude oil to the West [redacted]

The Persian Gulf will account for most of the non-Communist spare oil productive capacity through the remainder of the decade. As consumption rises later in the 1980s, the limited spare capacity outside the Gulf will be brought back into production. [redacted]

The Strait of Hormuz

The Strait of Hormuz is the sole sea outlet for the Persian Gulf. Last year 9.3 million b/d of oil passed through the Strait—over 80 percent of Gulf oil exports. The Strait is about 275-km long and, on

average, 80-km wide. Traffic is separated into two 1.8-km-wide shipping channels, each at least 50 meters deep. Deep water and strong currents make the Strait difficult to mine or block. It is narrow enough, however, to be interdicted by relatively weak air and naval forces or shore-based guided missiles. A threat of closure through force would have a large psychological impact on shippers, few of whom would be willing to run even a weakly enforced blockade. [redacted]

Alternative Export Routes

Four large-diameter pipelines provide alternatives for the export of about 4 million b/d of crude oil. In 1982, however, an average of only about 1.9 million

Secret

29 April 1983

Secret

b/d of Persian Gulf oil moved by way of pipeline around the Strait—17 percent of total exports from the Gulf region. []

The Saudi Pipelines

Saudi Arabia's only direct link with the Mediterranean is the *Trans-Arabian Pipeline* (Tapline) which runs from Saudi Arabia's eastern oilfields to the Lebanese port of Sidon. Completed in 1950, the 1,200-km-long line had been capable of carrying 500,000 b/d until Riyadh halted crude exports by way of the Mediterranean in 1975. The line has since been used only to supply refineries in Jordan and Lebanon, with shipments averaging less than 100,000 b/d. [] cannibalization of pumps and equipment has probably cut Tapline's effective capacity in half. Fighting in Lebanon has damaged Tapline facilities there, and the abandonment of the Lebanese portion of the line, unused since 1981, was recently announced. []

Petroline, the 1,200-km east-west pipeline, opened in July 1981, connecting the Al Ghawar Oilfield at Abqaiq to the Red Sea port of Yanbu al Bahr. The pipeline was built to enhance Saudi export flexibility by providing an export outlet bypassing the Strait of Hormuz, while supplying three new refineries on the western coast. The line's design capacity is 1.85 million b/d, but high transit fees have made customers reluctant to lift oil at Yanbu al Bahr. Throughput in 1982 averaged only 1.1 million b/d and currently is running about 300,000 b/d. []

The Iraqi Pipelines

The *Iraq-Syria-Lebanon Pipeline* is the oldest export pipeline in the Middle East. First opened in 1934, the original line was laid from the Karkuk Oilfield in Iraq through Syria to the Lebanese port of Tripoli. It has since been expanded to include three additional pipelines and a northern spur to

the Syrian port of Baniyas. Total capacity of the system is 1.2 million b/d. In recent years, operation of the line has been interrupted by political differences between Baghdad and Damascus and unrest in Lebanon. A dispute over transit fees closed the pipeline from 1976 to 1979, and in April 1982 Syria shut the line in a show of support for Iran. Sporadic incidents of sabotage occurred during periods the pipeline was in use, although operations were never seriously affected. From 1979 to 1982, the Iraq-Syria-Lebanon pipeline system carried a maximum of about 700,000 b/d. []

The export capacity of the Iraq-Syria-Lebanon pipeline may be limited by its tanker-loading terminals. The nominal export capacity of the port of Baniyas is 830,000 b/d; reconfiguration of berths in 1976-77 enabling Syria to import refined petroleum products reduced this to an estimated 400,000 b/d. We do not know if this port constraint has been lifted. While the line was open in the 1979-82 period, however, Iraqi exports through Baniyas never exceeded 400,000 b/d. The port at Tripoli has the capacity to export about 650,000 b/d and is capable of handling tankers up to 300,000 dead-weight tons (dwt), more than twice the size of those that can be berthed at Baniyas. []

The *Iraq-Turkey Pipeline*, running from the Karkuk Oilfields in northern Iraq to a Mediterranean loading facility near Ceyhan, Turkey, is currently Baghdad's sole export route. Its capacity of 700,000 b/d has largely been utilized since the Syrian pipeline was closed. Periodic sabotage has closed the line several times since the Iran-Iraq war began, but damage has been minimal and the flow of oil has not been stopped for long. []

Iraq's internal "*North-South*" pipeline is also a major link in the country's oil export system. The pipeline links the Iraq-Syria-Lebanon line at Hadithah in western Iraq to the southern oilfields near Basra and is capable of pumping oil in either direction. The line's capacity is 980,000 b/d pumping south, and 880,000 b/d north. []

Secret

29 April 1983

Major Middle East Crude Oil Pipelines as of 1 January 1983

	Point of Origin	Export Terminal	Nominal Capacity (million b/d)	Diameter (inches)	Length (km)	Number of Pump Stations	Date Opened	Export Terminal Capacity (thousand b/d)	Storage Capacity (million bbl)	Maximum Tanker Size (thousand dwt)	Remarks
The Iraqi system											
Iraq-Syria-Lebanon	Karkuk Oilfield, Iraq	Tripoli, Lebanon	0.05	12	856	7	1934	645	1.4	300	Original Middle East long-distance pipeline.
	Karkuk	Tripoli	0.10	16	856		1949				Parallels 12-inch line; utilizes same pump stations and export facilities.
	Karkuk	Baniyas, Syria	0.35	30-32	891		1952	830	5.6	120	Parallels 12- and 16-inch lines for 795 km, utilizing their pump stations.
	Karkuk	Baniyas	0.70	30-32	891		1961				"Loops" on original 32-inch line connected to form second 32-inch pipeline, raising total system capacity to 1.2 million h/d. A 30-inch spur to Tripoli was constructed alongside the 12- and 16-inch pipelines.
Iraq-Turkey (BOTAS)	Karkuk, Iraq	Ceyhan, Turkey	0.70	40	981	5	1977	1,000 (minimum)	7.0	300	Pipeline capacity being expanded by 280,000 h/d by mid-1984.
Iraq Strategic Pipeline	Hadithah, Iraq	Ar Rumaylah, Iraq	0.98 (south) 0.88 (north)	42	655	3	1976				Connects Iraq's northern and southern oilfields; crude oil can be pumped in either direction.
The Saudi system											
Trans-Arabian Pipeline (Tapline)	Al Qaysumah, Saudi Arabia	Sidon, Lebanon	0.50	30-31	1,213	8	1950	500 (minimum)	4.1	150	Lebanese section closed and possibly will be abandoned; pipeline is open to Jordan, supplying about 50,000 h/d. Tapline's effective capacity may be only about 250,000 h/d.
Petroline	Abqaiq, Saudi Arabia	Yanbu al Bahr, Saudi Arabia	1.85	48	1,202	11	1981	3,700 (minimum)	11.0	500	1982 throughput approximately 1.1 million b/d.
Egypt											
Suez-Mediterranean (SuMed)	Ayn Sukhnah, Egypt	Sidi Kerir, Egypt	1.60	2 by 42	320	2	1977	1,700 (estimated)	7.5 (both terminals)	285 (both terminals)	Connects Red and Mediterranean Seas, bypassing Suez Canal; minor modifications could increase capacity to 1.9 million h/d.

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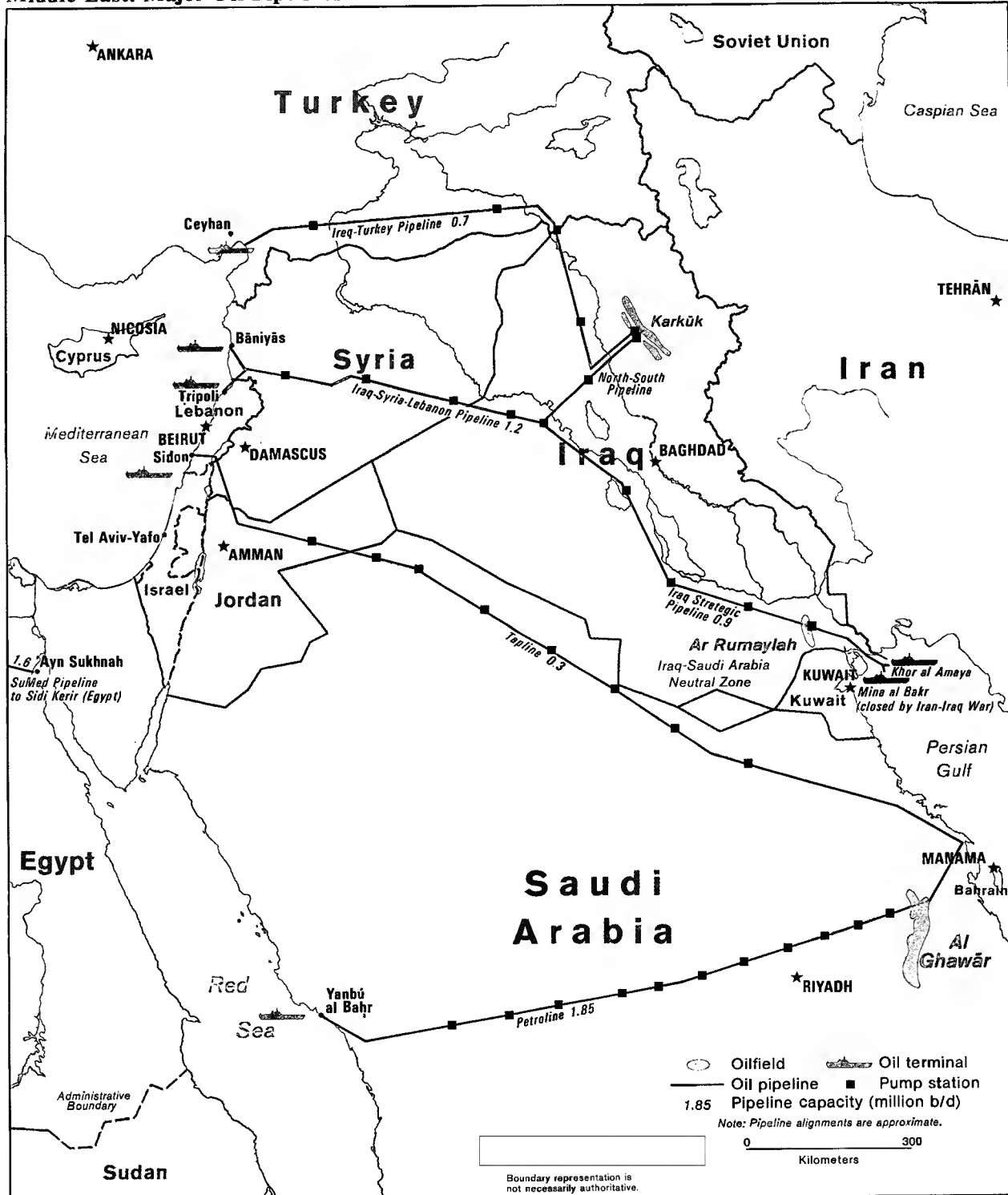
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29 April 1983

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Middle East: Major Oil Pipelines



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Secret
29 April 1983

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Egypt's SuMed Pipeline

Egypt's 1.6-million-b/d pipeline from the Gulf of Suez to the Mediterranean (the SuMed Pipeline) facilitates the movement of Persian Gulf oil from the Red Sea to southern Europe. The pipeline cuts approximately 13,000 km off the alternate route around the Cape of Good Hope and reduces costs by allowing the movement of oil to and from Egypt in ultralarge crude carriers that cannot transit the Suez Canal. In 1981 and 1982 the SuMed Pipeline operated above capacity, although early projections for 1983 indicate throughput may only be about 1 million b/d this year. []

dad and Damascus, however, make this action unlikely.

- Addition of a pump station could increase the capacity of Saudi Arabia's Petroline by 500,000 b/d within two years. Construction of a parallel pipeline would double capacity to 3.7 million b/d but would take at least four years to complete.
- An additional loading berth at each terminal could add 300,000 b/d to Egypt's SuMed Pipeline capacity, while construction of another pump station could boost throughput to 2.1 to 2.3 million b/d. []

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Expansion of Middle Eastern Pipelines

The vulnerability of the Strait of Hormuz has led Persian Gulf oil producers to consider ways to increase their export flexibility. The closure of Iraqi export terminals in the Gulf because of war damage in the fall of 1980 and the threat posed by Iran to exports from the rest of the Gulf has added urgency to these efforts. With the recent softening of the oil market, however, much of the momentum behind new projects is eroding. []

Construction of New Pipelines

Several new pipelines are now under consideration. An Iraqi line across Saudi Arabia, recently approved by Riyadh, appears the most likely to go ahead. Baghdad is developing plans for the 1.6-million-b/d pipeline, which would cost an estimated \$3.6 billion. The line would run west of Kuwait, joining Petroline's right-of-way over the mountains in western Saudi Arabia to end near Yanbu al Bahr. An international consortium is being formed to assist Iraq in planning and financing the project. []

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Capacity Increases in Existing Lines

Although most existing pipelines have been considered for expansion since 1979, work has begun only on the Iraqi line through Turkey. Baghdad has already let contracts for the construction of five new pump stations, replacement of existing pumps, and the construction of 75 km of parallel pipeline to enhance flow in uphill sections. The project—costing an estimated \$140 million—will increase the pipeline's present 700,000-b/d capacity to 980,000 b/d by mid-1984. []

Proposals for other pipelines from the Persian Gulf include:

- A 1-million-b/d line linking Kuwait, Saudi Arabia, Qatar, the UAE, and possibly Iraq to the southern coast of Oman.
- A 1-million-b/d pipeline from Saudi Arabia's southeastern Shaybah and Ramlah oilfields to Oman.
- A 1.6-million-b/d line running entirely within the UAE, from Abu Dhabi to the Emirate of Fu-jayrah on the Gulf of Oman. []

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Preliminary feasibility studies to expand other Middle East pipelines have also been conducted:

- By adding pumps at existing stations, Iraq could increase the capacity of the Syrian pipeline by 200,000 b/d. Political differences between Bagh-

Outlook

We believe few of the new pipelines will be built. With oil revenues plummeting, Gulf producers are

Secret

Middle East: Proposed Crude Oil Pipelines



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Secret
29 April 1983

Secret

not only reluctant to allocate funds for new pipelines, but they are also finding that pipeline expansion is financially burdensome. The US Embassy in Jiddah reports that raising the capacity of Saudi Arabia's Petroline by 500,000 b/d would cost an estimated \$1 billion; the original price for the pipeline was only \$1.6 billion. [REDACTED]

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The project most likely to proceed is the Iraq-Saudi Arabia pipeline. According to Embassy reporting, Baghdad continued to press King Fahd on the issue until he finally gave his go-ahead in talks last February. With Iraq responsible for finding financing, however, it is doubtful whether the approximately \$4 billion needed will soon be forthcoming. Construction is estimated to take four to five years; hence, the line could not be in operation before 1987 even if work started this year. [REDACTED]

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By the end of the decade, the West will still require some 10-11 million b/d of oil from the Persian Gulf. With the capacity of Gulf oil export pipelines unlikely to expand much, the vulnerability of Persian Gulf oil to disruption will not be significantly moderated. We believe that by 1990 the capacity of export pipelines from the Persian Gulf will still be about 4 million b/d. The West, therefore, will continue to ship a minimum of 6 million b/d of oil through the Strait of Hormuz, and the Strait will remain the single most important oil transport route in the non-Communist world. [REDACTED]

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[REDACTED]

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A world map illustrating the migration patterns of the genus *Rana*. Arrows of varying thicknesses represent migration routes, with numerical values indicating the relative magnitude of migration. Key features include:

- From S.E. Asia:** Arrows point towards North America and Europe.
- From Caribbean:** An arrow points towards Central America.
- Europe:** Multiple arrows originate from various European locations, with values such as 2.6, 0.8, 0.6, 1.6, and 1.3.
- Africa:** An arrow points from the southern tip of Africa towards South America.
- North America:** A large arrow points from the Iberian Peninsula towards the United States.
- South America:** An arrow points from the northern part of the continent towards the Caribbean.
- Asia:** An arrow points from the Indian subcontinent towards Southeast Asia.

^a First-half 1982 data.

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Japanese Energy Security: Prospects and Implications

Japan will remain extremely vulnerable to oil supply disruptions over the next two decades because of a lack of indigenous energy resources and prospects for slow growth in nonoil energy use. Imported oil will account for about one-half of Japan's energy needs through the year 2000, and the bulk of Japan's oil supplies probably will continue to come from politically unstable Persian Gulf sources. US options for enhancing Japanese energy security are limited.

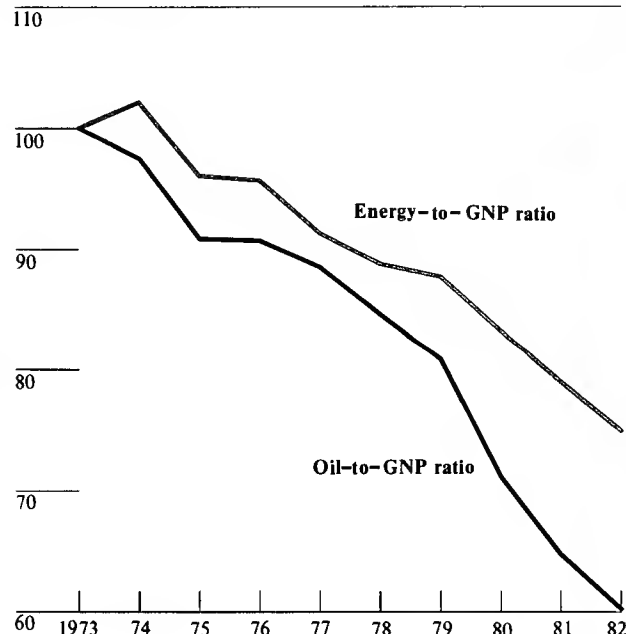
Energy in Japan

Paralleling dramatic economic growth, Japanese energy consumption rose sharply during the 1960s and early 1970s—jumping from 1.9 million barrels per day oil equivalent (b/doe) in 1960 to 7.0 million b/doe in 1973. Cheap imported oil met most of Japan's burgeoning energy needs, and by 1973 dependence on imported oil stood at 77 percent of total energy use. Rapid growth in energy and oil demand ended abruptly following the 1973 oil crisis. Through 1982 total energy consumption increased by less than 300,000 b/doe, and oil use declined by over 900,000 b/d.

Sluggish growth in energy demand and the falloff in oil use can be traced to slower economic growth and sharply higher oil prices. Annual economic growth rose an average of 3.4 percent during 1973-82—approximately one-third the rate of the 1960-72 period. On the price front, imported crude oil prices increased tenfold since 1973—spurring major improvements in energy efficiency. During this same period, the Japanese economy shifted from heavy, energy intensive industries, such as steel, to processing and assembling industries with low energy inputs, such as electronics. Interfuel substitution further reduced oil demand.

Measures of Efficiency

Index: 1973=100



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Nevertheless, Japan still faces a serious energy security problem. Poor in domestic resources, Japan depends upon imported energy for over 80 percent of its energy needs. Imported oil is the

Secret

 DI IEEW 83-017
 29 April 1983

Secret

dominant fuel, accounting for over 60 percent of the country's total energy consumption. Nearly two-thirds of Japan's oil requirements, moreover, come from the politically unstable Persian Gulf.

Energy Outlook

In the past year, Japanese Government and private-sector forecasts of 1990 energy needs have been trimmed by about 10 to 20 percent. Japan's recent record on conservation, together with lower projections for economic growth in the years ahead, account for these cuts. The maturation of the Japanese economy and its shift toward high-technology services will further restrain energy demand. According to the Japanese Economic Council, the share of GDP accounted for by the service sector will rise from 33 percent in 1980 to nearly 50 percent by the year 2000.

The most recent Japanese Government forecast estimates that 1990 energy needs will total 10.7 million b/doe. We believe that this projection—which assumes an annual economic growth rate of 5 percent—is too high. According to the International Energy Agency, the Japanese Economic Advisory Council is revising its midterm economic forecasts, which Japanese observers suggest are likely to show annual economic growth of 3.5 to 4 percent. Recent Japanese private-sector projections already contain more realistic growth assumptions:

- The Petroleum Association of Japan and the Bank of Tokyo project 1990 requirements at around 9 million b/doe.
- The Institute of Energy Economics in December dropped its base 1990 forecast to 8.3 million b/doe.
- Recent projections place 1990 requirements for the Japanese at around 8.5 million b/doe. These forecasts, which are predicated on annual economic growth of 3.5 percent, are roughly 15 percent below year earlier projections.

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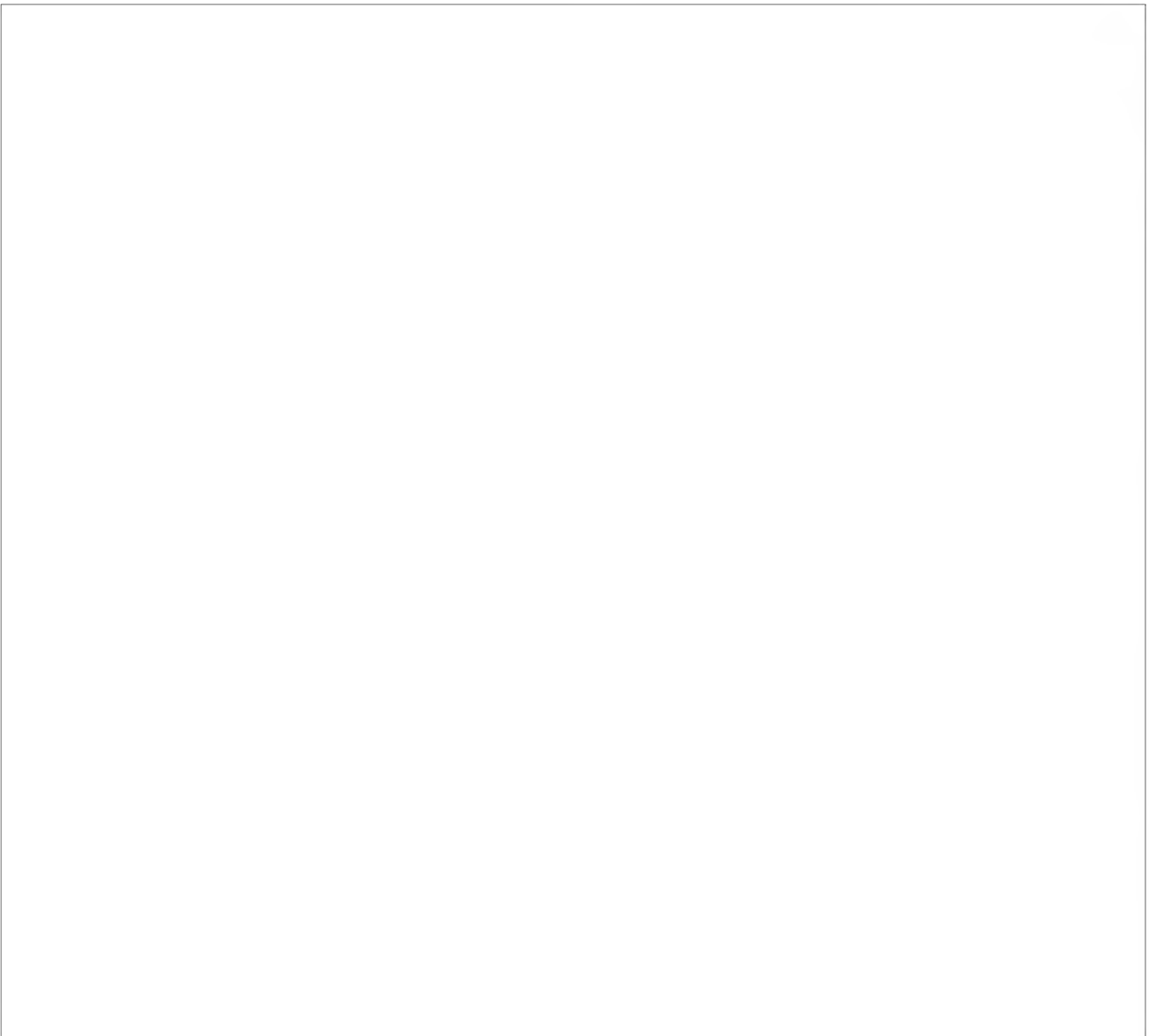
On the basis of the most recent Japanese private-sector forecasts, and assuming an annual economic growth rate of about 3 percent, we believe Japanese energy requirements will reach 8 to 8.5 million b/doe in 1990, compared with about 7.3 million b/doe last year. By the year 2000, energy demand is likely to be about 8.8 to 9.3 million b/doe—assuming about a 3-percent annual GNP growth

Secret

29 April 1983

Secret

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rate during the 1990s and continued improvements in energy conservation. Although real economic growth may prove higher than what we have assumed for the 1990s, it would not necessarily result in corresponding gains in energy consumption, since much of Japan's future economic expansion will occur in high-tech and service industries rather than in energy intensive industries.

Demand By Component

Oil. Despite prospects for slow growth in energy consumption, Japan will remain heavily dependent upon oil over the next two decades. Based on our assessment of the development of nonoil energy

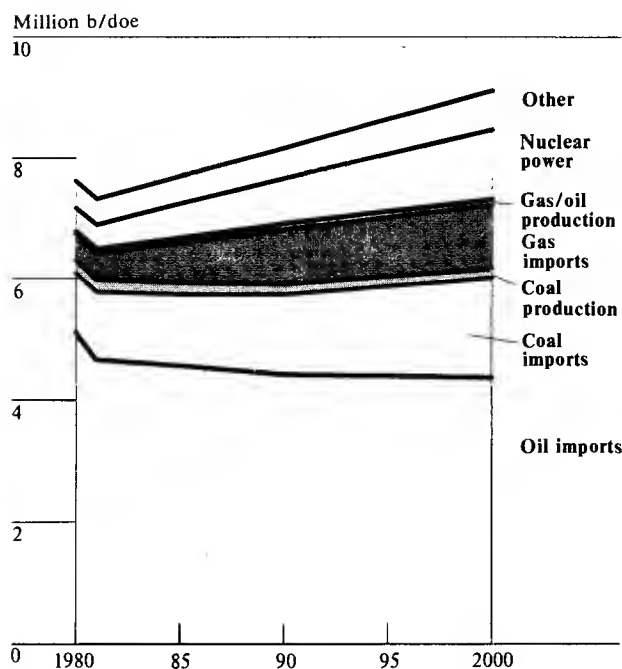
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29 April 1983

Secret

Energy Supply and Demand



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sources, we believe oil consumption will be approximately 4.5 million b/doe in 1990 and around 4.3 million b/doe in the year 2000. As a result, imported oil will account for nearly 55 percent of Japan's energy requirements in 1990 and just under 50 percent by the end of the century.

Natural Gas. Because of Japanese efforts to reduce oil use and the clean burning properties of gas, demand for natural gas is likely to grow more rapidly than the demand for any other major fuel during the 1980s. Gas requirements, however, will be substantially less than the Japanese were expecting when they initiated many of their gas supply projects in the mid-1970s. We believe Japan's gas needs will rise from current levels of about 500,000 b/doe to approximately 950,000 b/doe in 1990.

This forecast, while in line with Japanese private-sector forecasts, is roughly 250,000 b/doe below the official Japanese Government projection.

gas requirements during the 1990s are likely to increase by only about 100,000 to 200,000 b/doe—far below government growth projections.

Lower gas demand estimates result in large part from lower prices for competing fuels. The price of imported natural gas (LNG) is tied to crude oil prices in current contracts. Consequently, the price of heavy fuel oil—a lower quality byproduct of crude oil and a major fuel in electric utilities and industry—is cheaper than LNG. Japan's LNG contracts, moreover, contain inflexible "take or pay" clauses that lock consumers into high-cost supplies. As a result little growth in gas use for electricity generation beyond 1990, and the projected increase in industrial gas requirements is minimal.

Coal. We believe coal requirements in 1990 will fall far short of government projections. Lower than expected growth in electricity demand has lessened the need for new power plants. Because of existing LNG commitments and nuclear power plants under construction or site approved, we believe the bulk of the reduction in new power plant construction will be coal-fired units. Declining oil prices, moreover, have recently made the construction of new coal-fired plants uneconomic compared with continued operation of existing oil-fired facilities. In industry, we believe future growth in coal use will be sluggish, in large part because of the projected slow growth in steel production, which currently accounts for about 75 percent of Japan's coal use.

Taking these factors into account, we place Japanese coal requirements in 1990 around 1.5 million b/doe—only about 150,000 b/doe above the 1981 level. Even if the Japanese step up construction of coal-fired electricity generation plants in the 1990s, we believe coal requirements in the year 2000 will

Secret

29 April 1983

34

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Japan: Energy Demand

Thousand b/doe

	1973	1980	1981	1990	2000
Total energy use	7,016	7,552	7,434	8,000-8,500	8,800-9,300
Total imports	6,307	6,508	6,205	6,550-6,900	6,800-7,150
Oil consumption	5,421	5,000	4,742	4,450-4,550	4,300-4,400
Domestic production	14	10	8	50	50
Imports	5,400	5,091	4,650	4,400-4,500	4,250-4,350
Total OPEC ^a	5,070	4,312	3,789	3,450-3,550	3,200-3,300
Persian Gulf	4,120	3,547	2,990	2,600-2,700	2,350-2,450
Other OPEC	950	765	799	850	850
Other ^b	330	779	861	950	1,050
Natural gas consumption	110	475	491	900-1,000	1,050-1,150
Domestic production	50	41	55	50	50
Imports	60	434	436	850-950	1,000-1,100 ^c
Indonesia		219	224	385	360-560
Abu Dhabi		50	50	55	0-240
Brunei	35	143	134	130	
Alaska	25	22	28		
Malaysia				155	155
Australia				125-150	155
USSR				0-75	75
Canada					75
Qatar					0-155
Thailand					0-100
Coal consumption	1,099	1,239	1,362	1,500-1,600	1,750-1,850
Domestic production	252	214	209	150-200	150-200
Imports	847	983	1,119	1,300-1,450	1,550-1,700
Australia	371	426	502	600-650	700-775
United States	246	290	347	300-325	350-375
Canada	155	162	156	200-250	250-275
Other	75	105	114	200-225	250-275
Hydro and other	340	447	433	450-550	600-700
Nuclear power	46	391	406	700-800	1,100-1,200

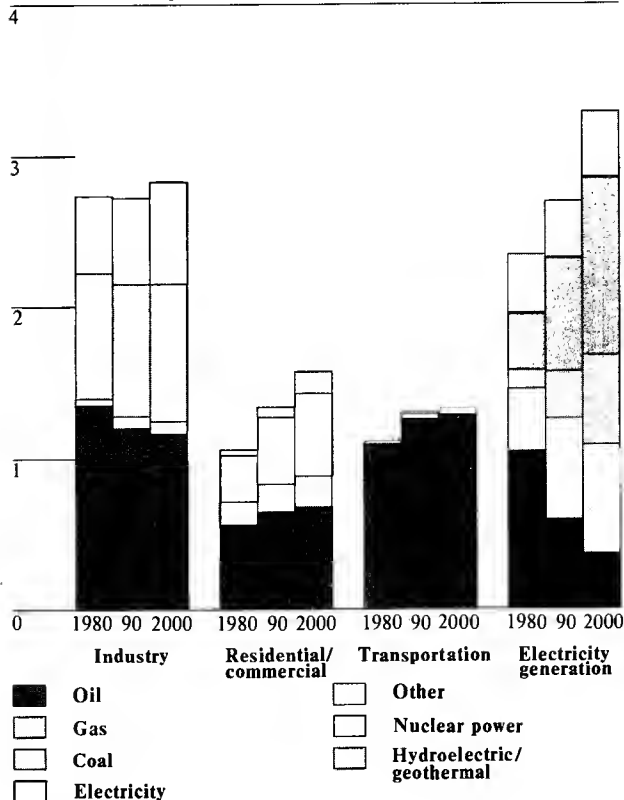
^a Includes OAPC members.^b Including unknown.^c Imports will not add to the total due to the uncertainty surrounding future LNG projects.

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Sectoral Energy Demand

Million b/d oil equivalent



589246 4-83

reach only 1.8 million b/doe, an amount sharply below current government projections of 2.7 million b/doe.

Nuclear Power. Japan has the world's third-largest nuclear power program—ranking behind the United States and France. Future growth in nuclear power, however, is constrained by lower levels of projected electricity demand, public opposition, and siting difficulties. Of the 30,000 megawatts (MW) of capacity planned to be added during the 1980s, we believe only 11,000 MW is likely to be in

operation by 1990 given current construction lead-times. As a result, we place output from nuclear power in 1990 at around 700,000 to 800,000 b/doe—400,000 b/doe below government projections. By the year 2000, we believe nuclear power output probably will reach about 1.1 to 1.2 million b/doe—at least 1.3 million b/doe below official government projections.

New Energies.¹ According to industry forecasts, unconventional energy sources—such as solar, wind, bio-mass and synthetic fuels—are unlikely to reduce Japan's dependence upon imported oil over the next two decades. Projections of lower future oil price levels have lessened the perceived need to develop new energy sources. Sluggish oil and electricity consumption have also reduced government revenues from oil and electricity taxes—the primary sources of funds for alternative energy development.

Import Dependence

Because of limited domestic oil reserves, Japan must rely on imports for nearly all of its oil. We believe the bulk of these imports will come from the politically unstable Persian Gulf because it contains 60 percent of the Free World's oil reserves. As a result, Japan will remain extremely vulnerable to oil supply disruptions over the next two decades.

Although Japan also relies on imports for the bulk of its gas and coal needs, imports of coal and LNG pose far less of a security risk than oil. Based on current and proposed contracts, Japan is expected to be importing LNG from six or seven different countries in 1990. Moreover, Japan probably could withstand a major LNG supply disruption as long as oil supplies were available. Japanese electric utilities—the principal gas consumers—maintain a significant ability to switch to alternative fuels.

Secret
29 April 1983

Secret

Currently 62 percent of LNG-fired capacity can switch to alternative fuels. As for coal, the international market has abundant supplies, and export capability will likely exceed demand through at least the 1990s, according to market forecasts. []

Energy Security Options

Japan could enhance its energy security by diversifying energy imports among fuels and sources of supply. Japan could, for example, lessen its vulnerability to an oil cutoff by:

- Increasing efforts to diversify oil supplies away from Persian Gulf sources.
- Boosting government-owned oil stocks.
- Easing or reversing the trend to increased reliance on producer countries for oil supplies rather than major oil companies that act as market buffers in the event of a supply disruption.
- Strengthening the refining sector to ensure sufficient production of lighter grade oil products. []

Given numerous constraints, we believe there is little potential for Japan to significantly expand its use of nonoil energy sources beyond estimated levels. Increased use of LNG is unlikely because of high relative prices. A myriad of technical problems complicate coal use in industry, and new coal-fired plants cannot economically replace existing oil-fired facilities. A large increase in synthetic fuels would require huge government subsidies because of the uneconomic nature of synfuels production and the immense capital requirements. As for nuclear power, public opposition and siting difficulties remain a major hurdle to further construction. []

US options for enhancing Japanese energy security are limited. The export of Alaskan oil to Japan—which could reduce Japan's dependence on Persian Gulf sources and lessen Arab leverage on Japan—is currently forbidden by US law. Natural gas from the North Slope could obviate the need for Soviet gas and reduce dependence on Indonesian supplies, but Tokyo has already contracted for all the gas it will need until 1990. Beyond 1990, additional gas requirements probably will be insufficient to justify

on economic grounds construction of a proposed Alaskan gas pipeline to deliver North Slope gas to southern Alaska for shipment to Japan. As for coal, prospects for increased sales look bleak. Indeed, Japanese coal requirements in 1990 will probably fall short of government projections by 600,000 b/doe, and purchases of US coal could well decline from present levels because of its high cost and stiff competition from other suppliers. []

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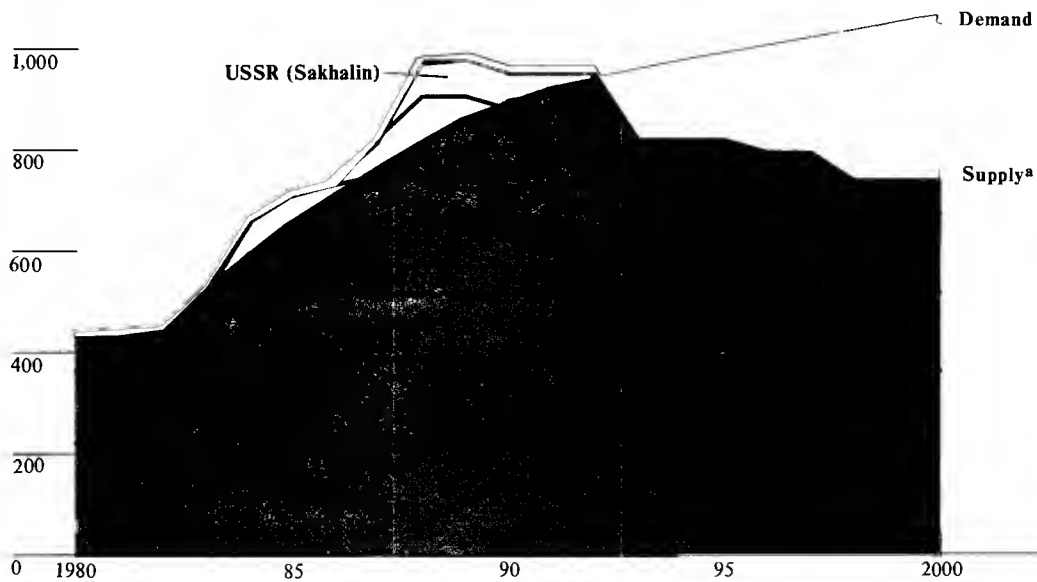
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Liquefied Natural Gas Supply and Demand

Thousand b/d oil equivalent
1,200



- ☐ Potential surplus
- ☐ Potential supply gap

^aBased on projects under construction or agreed to.

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29 April 1983

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The UK Market for Norwegian Gas: An Energy Security Issue

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Despite sharp reductions in industry forecasts of UK gas requirements, the United Kingdom still will need additional Norwegian gas in the early 1990s, and we expect London to compete aggressively with other West European countries for gas from Norway's Sleipner field. If the United Kingdom wins the bidding, as we now expect, we estimate that the British could have a small surplus of natural gas by the mid-1990s. The existence of a surplus raises the possibility of a pipeline to export gas to the continent, but we believe a number of political constraints must be overcome before London would permit gas exports.

Recent Trends

Sluggish economic growth and effective conservation measures have led to sharp reductions in energy consumption in the United Kingdom in recent years. UK demand for natural gas has continued to grow, however, increasing nearly 4 percent per year from 1978 to 1981. Growth in gas demand was strongest in the residential and commercial sectors; these account for over 60 percent of gas consumption. The rapid rise in demand for gas was due primarily to its low price relative to alternative fuels, especially in the residential sector where gas prices from 1978 to 1981 averaged only about 65 percent of the price of light fuel oil, the closest substitute.

UK gas production peaked at 705,000 barrels per day oil equivalent (b/doe)¹ in 1977, then declined steadily to about 607,000 b/doe in 1981. Most of the growth in UK gas consumption—which totaled 835,000 b/doe in 1981—was supplied by production from the Frigg field in the northern North Sea.

¹ One billion cubic meters (bcm) = 16,400 b/doe.

Frigg is 40 percent British and 60 percent Norwegian. London had previously negotiated with Norway to purchase Oslo's share of Frigg gas, and UK gas imports from Norway increased rapidly, reaching nearly 200,000 b/doe in 1981.

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Government Price Policy

UK regulations required that British Gas Corporation (BGC), a public entity, have first right to purchase all gas produced on the UK Continental Shelf. Intent on encouraging substitution of gas for oil, BGC maintained gas prices far below market rates. UK gas producers argued that low prices failed to provide the incentive to increase or even maintain domestic gas production. Frigg gas production peaked in 1981 and in response BGC has recently renegotiated producer price agreements to spur additional production.

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A number of additional UK North Sea projects have recently been undertaken due to these price increases. These projects will not, however, yield enough gas to match the projected growth in consumption. As a result, BGC is actively seeking additional gas supplies. London has also implemented policies designed to moderate growth in gas demand; in 1981, for example, London instructed the BGC to raise real residential gas prices by 10 percent per year during 1981-83. Because of this change and the slippage in crude oil prices the once large price difference between the two fuels has narrowed.

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29 April 1983

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Gas Demand Outlook

Industry forecasts prepared in the first half of 1982 projected long-term growth in UK gas demand of roughly 2 percent per year, rising to as high as 1.1 million b/doe by 1995. As a result of gas price increases, two major oil companies prepared revised projections in October 1982 that are substantially lower, predicting consumption of 930,000 to 1,000,000 b/doe in 1995. Most of the predicted growth in UK gas demand is still expected to occur in the residential and commercial sector. [REDACTED]

In our judgment, the most recent forecasts are more accurate than those prepared in early 1982:

- Declining real-oil prices, expected until 1985, will increase the price of gas relative to oil.
- North Sea gas supplies will be subject to increasing cost and competition from continental users.
- Government policies no longer encourage artificially low gas prices.
- Projections indicating moderate UK economic growth do not support forecasts of continued high growth in gas consumption.

The recent decline in nominal oil prices will also erode the relative price advantage of gas, virtually ending growth in gas consumption in the industrial sector and moderating consumption growth in the residential and commercial sectors. [REDACTED]

Gas Production

Current industry and government forecasts of UK gas production range from 670,000 to 710,000 b/doe in 1985 and 600,000 to 900,000 b/doe in 1995. Official UK estimates are at the lower end of these ranges. We believe that future production will approximate the latest industry forecasts. In our judgment, official statistics underestimate remaining recoverable gas reserves on the UK Continental Shelf, and the concessions that London recently made on tax policies will allow domestic production to rise above official estimates. [REDACTED]

London has already taken steps to spur additional production:

- Prices paid by the BGC to domestic gas producers are increasing. Last October the BGC signed a contract with operators of the North Alwyn gasfield to pay \$4 per million BTU, the highest price ever paid for domestic gas.
- The eighth licensing round, currently under way, includes 38 southern-sector fields with gas potential. Although overall industry response has been

Secret

29 April 1983

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disappointing, North Sea companies have concentrated their bids on the possible gas-producing concessions.

- The Oil and Gas Bill of 1982 will end the BGC's monopoly as sole supplier to the industrial sector and large commercial users, allowing them to contract directly with alternative gas suppliers.

We estimate that these moves probably will increase domestic gas production to about 820,000 b/doe by 1990 and between 830,000 to 900,000 b/doe in 1995. []

Balancing Gas Needs—Looking Ahead to the 1990s

We believe the United Kingdom will be able to meet domestic gas demand until the end of the decade without additional imports, and may even have a small volume of excess gas in the late 1980s. According to official government projections, however, Norwegian Frigg production will decline rapidly after 1990, falling from about 200,000 b/doe in 1990 to zero in 1993. Since UK gas consumption will continue to grow, reaching 930,000 to 1 million b/doe by 1995, we believe the United Kingdom will bid aggressively for gas from Norway's Sleipner field to meet its projected import requirement. Sleipner contains an estimated 2 billion boe of recoverable gas reserves and Statoil, the Norwegian national oil company, has decided on a strategy of rapid depletion. []

[] production of as much as 50,000 b/doe could begin by 1991, increasing to a maximum of 330,000 b/doe by 1995. The Norwegians are presently negotiating with the British and other European buyers for the sale of Sleipner gas. []

Because of the location of the Sleipner field, economics dictate that virtually all of the gas be landed either in the United Kingdom or on the Continent. Several factors favor the United Kingdom:

- Sleipner gas contains a high amount of carbon dioxide, which requires special processing and

possibly separate receiving facilities. London has experience with this problem, and several smaller UK gasfields containing carbon dioxide could be linked to a Sleipner system.

- The location of Sleipner is ideal for linkage to the existing Frigg pipeline system, which will have spare capacity of about 330,000 b/doe by 1993. This method of landing Sleipner gas would cost only one-fourth as much as a separate pipeline to the Continent.
- The United Kingdom currently imports about 200,000 b/doe of Norwegian gas and considers Norway a desirable and secure supplier. European buyers are not expected to bid as aggressively as London for Sleipner gas in view of their projected lower gas demand and alternative sources of supply. []

Statoil, operator of Sleipner, probably will demand a price comparable to that received for Statfjord gas (about \$3.50 per million BTU at the wellhead), which is substantially higher than what the BGC has been paying for most other gas supplies. We believe, however, that the BGC is willing to pay a competitive price for Norwegian gas since there are now no other viable suppliers and BGC has not balked at paying competitive prices for Norwegian gas in the past. []

A Link to the Continent in the 1990s?

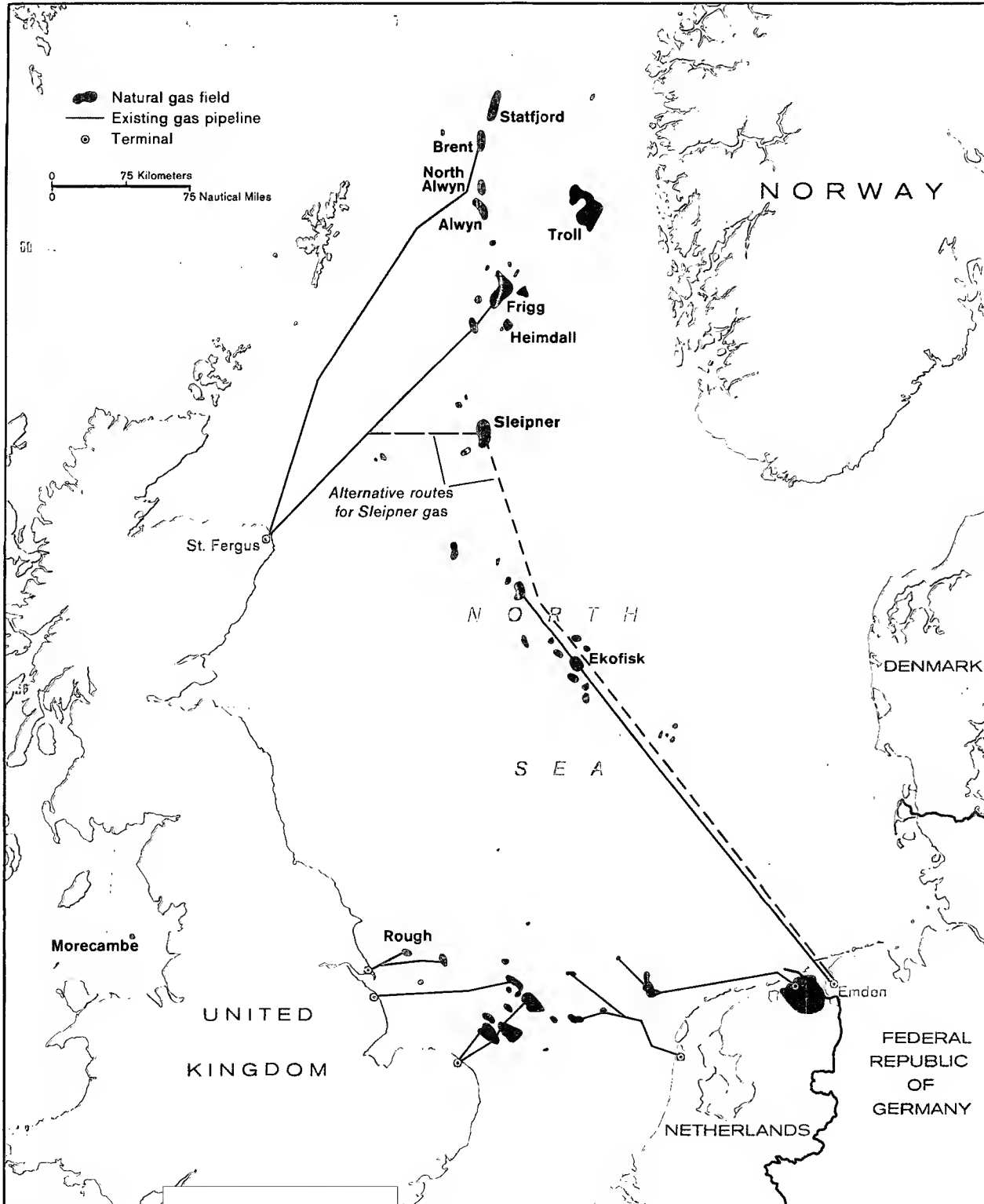
The West European gas market is separated into two distinct segments, the United Kingdom and the Continent. Although the two are in close geographic proximity, there is no interconnecting pipeline. If the United Kingdom gets Sleipner gas, as we now expect, and implements policies in the 1980s to encourage new gas development, the need for additional imports in the late 1990s will be minimized. Such policies—including official support for gas exploration and development and allowing domestic natural gas prices to rise to market levels—will allow domestic production to reach 830,000 to

Secret

29 April 1983

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North Sea Gasfields and Pipelines



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Secret
29 April 1983

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900,000 b/doe in 1995. If gas demand in 1995 is also in line with current industry estimates, the United Kingdom could have a small annual gas surplus of about 80,000 to 160,000 b/doe. This, in turn, would raise the possibility of the export of natural gas from the United Kingdom to the Continent. [redacted]

Several major oil companies have indicated that increased UK production would encourage a pipeline between southern offshore fields in the United Kingdom and the Continent. A pipeline to the Continent has several attractions:

- Swapping southern UK gas for Norwegian gas imports would lower delivery costs and lead times in developing northern Norwegian fields. [redacted]
[redacted] British reserves in the southern North Sea are more than sufficient to justify an economical swap arrangement.
- An integrated gas market would increase supply flexibility and energy security in the West European gas market.
- A pipeline would allow the United Kingdom to tap other gas supplies on the Continent once UK reserves begin to run out.
- Sales of surplus gas to the Continent could net the United Kingdom additional revenues in the 1990s, when we expect UK petroleum revenues to fall sharply. [redacted]

Nevertheless, there has been considerable resistance by BGC and the Energy Ministry to a gas pipeline link with the Continent. Principal among British concerns is the possibility that UK gas reserves would be depleted rapidly by buyers on the Continent in the event of a gas supply disruption or a surge in demand. Moreover, domestic opposition to exports of British gas apparently remains strong. Last December, for example, London decided to land the British share of Statfjord gas in the United Kingdom even though it will be far more costly than allowing the gas to flow through the Norwegian pipeline to Emden, West Germany. In addition, London is keenly aware of Norwegian opposition to an integration of the Continental and UK markets and would be reluctant to jeopardize any potential future supply arrangements with Oslo. Unless these political constraints can be overcome, we do not believe that London will permit a linkage with the Continental gas market in the foreseeable future. [redacted]

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